Session 10: Joint Resealing and Crack Sealing
Learning Outcomes

1. List the benefits of joint resealing
2. Describe desirable sealant properties and characteristics
3. Describe recommended installation procedures
4. Identify typical construction problems and appropriate remedies
Placement of an approved sealant material in an existing joint or crack to reduce moisture infiltration and prevent intrusion of incompressibles
PCC Pavement Deterioration

Influence of Moisture Infiltration

Cracks/Joints + Moisture Infiltration → Base/Subbase Softening

Loss of Fines (Pumping)
Corner Breaks
Transverse Joint Faulting
PCC Pavement Deterioration

Influence of Moisture Infiltration

Cracks + Moisture Infiltration → Breakdown of Existing Cracks

Deteriorated Cracks
PCC Pavement Deterioration
Influence of Incompressibles

Cracks/Joints + Incompressible Material

Joint Spalling
Blow-Ups
Debate: to seal or not to seal
Some believe the benefits do not offset the costs
Most agencies seal and reseal transverse joints
Recommendation: continue to reseal joints if they were originally sealed!
Joint Resealing
Guidelines and Project Selection

- Pavement not severely deteriorated
- Reseal when existing sealant not functional
- Install under moderate temperature conditions
- Recommended evaluation procedure:
  - Pavement distress survey
### Materials

- Joint sealant
- Thermoplastic materials
- Thermosetting materials
- Backer rod

<table>
<thead>
<tr>
<th>Sealant Type</th>
<th>Specification(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid, Hot-Applied</td>
<td></td>
<td>Thermoplastic</td>
</tr>
<tr>
<td>Rubberized Asphalt</td>
<td>ASTM D 6690, Type II</td>
<td>Self-leveling</td>
</tr>
<tr>
<td>Polymetric</td>
<td>ASTM D 6690, Type I</td>
<td>Self-leveling</td>
</tr>
<tr>
<td>Elastomeric</td>
<td>ASTM D 3406</td>
<td>Self-leveling</td>
</tr>
<tr>
<td>Elastic</td>
<td>ASTM D 1854</td>
<td>Jet fuel resistant</td>
</tr>
<tr>
<td>Elastomeric PVC Coal Tar</td>
<td>ASTM D 3569, 3582</td>
<td>Jet fuel resistant (though PVC is rarely used)</td>
</tr>
<tr>
<td>Liquid, Cold/Ambient-Applied</td>
<td></td>
<td>Thermosetting</td>
</tr>
<tr>
<td>Single Component</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicone</td>
<td>ASTM D 5893</td>
<td>Non-sag, toolable, low modulus</td>
</tr>
<tr>
<td>Silicone</td>
<td>ASTM D 5893</td>
<td>Self-leveling, no tooling, low modulus</td>
</tr>
<tr>
<td>Polysulfide</td>
<td>ASTM D 5893</td>
<td>Self-leveling, no tooling, ultra low modulus</td>
</tr>
<tr>
<td>Polyurethane</td>
<td>Fed Spec SS-S-200E</td>
<td>Self-leveling, no tooling, low modulus</td>
</tr>
<tr>
<td>Two Component</td>
<td></td>
<td>Self-leveling, no tooling, low modulus</td>
</tr>
<tr>
<td>Elastomeric Polymer</td>
<td>Fed Spec SS-S-200E</td>
<td>Jet fuel resistant</td>
</tr>
<tr>
<td>Preformed Compression Seals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polychloroprene Elastomeric Lubricant</td>
<td>ASTM D 2628, 2635</td>
<td>Jet fuel resistant (Used in installation)</td>
</tr>
<tr>
<td>Expansion Joint Filler</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preformed Filler Material</td>
<td>ASTM D 1751 (AASHTO M 213)</td>
<td>Bituminous, non-extruding, resilient</td>
</tr>
<tr>
<td>Preformed Filler Material</td>
<td>ASTM D 1752 (AASHTO M 153)</td>
<td>Sponge rubber, cork, and recycled PVC</td>
</tr>
<tr>
<td>Preformed Filler Material</td>
<td>ASTM D 994 (AASHTO M 33)</td>
<td>Bituminous</td>
</tr>
<tr>
<td>Backer Rod</td>
<td>ASTM D 5249</td>
<td>For hot- or cold-applied sealants</td>
</tr>
</tbody>
</table>

Table 10.1 on p. 10.3
Sealant Types

- Thermoplastic materials
  - Widely used sealant material
  - Rubberized and low-modulus rubberized asphalts
  - ASTM D 6690
- Thermosetting materials
  - Cures through chemical reaction
  - Silicone
  - ASTM D 5893
# Desirable Sealant Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durability</td>
<td>Resistance to traffic, moisture, sunshine, and climatic variation</td>
</tr>
<tr>
<td>Extensibility</td>
<td>Deformation without rupturing</td>
</tr>
<tr>
<td>Resilience</td>
<td>Recovery from deformation and resist stone intrusion</td>
</tr>
<tr>
<td>Adhesiveness</td>
<td>Adherence to joint/crack walls</td>
</tr>
<tr>
<td>Cohesiveness</td>
<td>Resistance to internal stresses (rupturing from elongation)</td>
</tr>
</tbody>
</table>
Sealant Material Selection

Factors

- Climate conditions
- Traffic level and percent trucks
- Crack extent and severity
- Contractor and agency experience
- Safety concerns
- Material availability and cost
Backer Rod

- Controls depth of sealant placement
- Prevents 3-sided adhesion in joint
- Closed-cell polychloroprene, polystyrene, polyurethane, and polyethylene
- Must be compatible with sealant type
- Diameter >25% than joint reservoir
Example Joint Reservoir

Shape Factor = $W:D$

Fig. 10.2 on p. 10.6
## Joint Reservoir Design

### Recommended Shape Factors

<table>
<thead>
<tr>
<th>Sealant Material Type</th>
<th>Typical Shape Factor (W:D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubberized Asphalt</td>
<td>1:1</td>
</tr>
<tr>
<td>Silicone</td>
<td>2:1</td>
</tr>
<tr>
<td>Polysulfide and Polyurethane</td>
<td>1:1</td>
</tr>
</tbody>
</table>

Table 10.2 on p. 10.7
Joint Reservoir Design
Common Configurations

- Recessed
- Flush-Filled
- Overbanded

Fig. 10.3 on p. 10.7
Construction: Joint Resealing

Procedure

1. Sealant removal
2. Joint refacing
3. Joint reservoir cleaning
4. Backer rod installation
5. New sealant installation
Construction: Joint Resealing
Sealant Removal with Joint Plow
Construction: Joint Resealing
Refacing
Construction: Joint Resealing

Refacing
Construction: Joint Resealing
Refacing Blades
Construction: Joint Resealing
Sandblasting
Construction: Joint Resealing

Waterblasting
Construction: Joint Resealing

Compressed Air
Construction: Joint Resealing

Backer Rod Installation
Construction: Joint Resealing

Installed Backer Rod
Construction: Joint Resealing

Sealant Installation

Hot-Poured Silicone
Construction: Joint Resealing

Longitudinal PCC/PCC Joints
Construction: Joint Resealing

Longitudinal PCC/PCC Joints

- Tied non-working joint
- Hot-poured thermoplastic materials
- Reservoir not always established
Construction: Joint Resealing

Longitudinal PCC/HMA Joints
Construction: Joint Resealing
Longitudinal PCC/HMA Joints

- Minimum width and depth of 25-mm (1-in)
- No backer rod required
- Hot-pour and silicone sealants
Construction: Joint Resealing
Longitudinal Sawcutting
Construction: Joint Resealing

Sawed Longitudinal Joint Reservoir
Construction: Joint Resealing
Sealed PCC/HMA Longitudinal Joint
Key Factors For Success

Joint Resealing

- Proper selection of candidates
- Selection of proper material
- Proper reservoir design and joint shape factor
- Proper reservoir preparation
- Proper sealant application techniques
- Monitor opening to traffic
Troubleshooting
What is wrong here?

Too Much Applied Sealant
Troubleshooting
What is wrong here?

Dirt on Refaced Surfaces
Troubleshooting

What is wrong here?

Bubbles in Sealant
Troubleshooting

Possible Construction Problems

- Problem: Tracking of material
- Potential causes? Solutions?
Crack Sealing
Guidelines for Sealing Cracks

- Seal working transverse cracks
- Can seal cracks ≤ 13 mm (0.5 in) wide
- Use special crack sawing blades
- Same general joint resealing procedures apply to crack sealing
Construction: Crack Sealing

Procedure

1. Crack sawing
2. Cleaning
3. Backer rod Installation
4. Sealant installation
Construction: Crack Sealing

Crack Sawing
Construction: Crack Sealing

Sawed Crack
Construction: Crack Sealing

Completed Crack Seal
Key Factors For Success

Crack Sealing

- Seal working transverse cracks
- Can seal cracks $\leq 13$ mm (0.5 in) wide
- Use special crack-sawing blades
- Same general joint resealing procedures apply to crack sealing
- Selection of proper material
Review: Learning Outcomes

1. List the benefits of joint resealing
2. Describe desirable sealant properties and characteristics
3. Describe recommended installation procedures
4. Identify typical construction problems and appropriate remedies